Chapter 13 – External Ethmoidectomy

Jonas T. Johnson

Ethmoid surgery is usually used in the relief of chronic sinusitis. A mucosal insult from infection, allergy, or exposure to a toxic substance results in mucosal edema with accompanying obstruction of normal sinus ventilation. Retention of secretions, disturbed ciliary function, and reduced oxygen capacity in the obstructed sinuses subsequently establishes a milieu that promotes the proliferation of bacteria.

As functional endoscopic sinus surgery has become the standard approach, the indications for external ethmoidectomy have declined. However, the external approach is still useful and may be used to ligate the ethmoid artery for epistaxis, drain an orbital abscess, reduce a fracture, expose the optic nerve, or remove a large osteoma. External ethmoidectomy is still used, by some surgeons, to provide wider exposure for removal of malignant tumors and in combination with anterior fossa approaches in cranial base surgery. All these procedures may be further enhanced with intraoperative navigation systems, which are now widely available. Therefore we have elected to maintain this chapter in this edition of this text.

Neoplastic transformation of ethmoid tissue is occasionally encountered. Inverted papilloma and a variety of benign tumors, such as hemangioma and hemangiopericytoma, may be encountered. A biopsy of an intranasal lesion in the office should be undertaken judiciously. Some tumors are vascular in origin and may bleed profusely. It is also prudent to withhold biopsy until the required imaging studies have been completed. This avoids distorting the image and may allow the surgeon an estimate of the vascularity of the lesion. Malignant tumors of the ethmoid are rarely encountered. Squamous cell carcinoma is most frequently observed; however, a variety of unusual entities such as adenocarcinoma or melanoma may arise in the ethmoid sinus. Chronic exposure to tobacco, dust, and industrial fumes has been implicated in the development of these lesions.[1,2]

PATIENT SELECTION

Management of chronic sinusitis with purulent rhinorrhea, nasal obstruction, and nasal polyposis may frustrate both patient and doctor. Surgery should be performed only after every effort has been made to eradicate infection through the administration of antibiotics and to reduce tissue edema through the use of decongestants and topical steroids. Some patients who have well-documented allergy will benefit from desensitization. When symptoms fail to respond to medical management, surgery may be considered. In most instances, surgical approaches are via an endoscopic route.

Benign neoplasia of the lateral nasal wall, such as inverted papilloma, may be removed with either an open approach or endoscopically. The key to success is proper preoperative assessment of extent of disease and total removal of the tumor.[3] Occasionally a patient with a symptomatic osteoma is encountered (Fig. 13-1). A high-volume lesion may require an external approach.

Figure 13-1 The mass displacing the medial aspect of the upper lid was an osteoma.

Patients with concurrent asthma and hypersensitivity to aspirin represent an especially sensitive subpopulation that may require administration of steroids and bronchodilators intraoperatively and postoperatively to prevent exacerbation of their underlying pulmonary disease. Patients with allergies and asthma tend to have the most chronic manifestations and are most likely to experience recurrent nasal polyposis. In this patient population, surgery should be aimed at the relief of symptoms, because “cure” is rarely achieved.

PREOPERATIVE EVALUATION

The surgeon must be constantly aware of the proximity of vital structures to the ethmoid sinus. The most important landmarks include the lamina papyracea, which is the thin plate of bone separating the ethmoid sinus from the orbit; the fovea ethmoidalis, which separates the ethmoid sinus from the anterior cranial fossa and is located at the attachment of the middle turbinate; and the optic nerve, which is located approximately 4 mm posterior to the posterior ethmoid cell. The cribriform plate is located inferior to the roof of the ethmoid sinus, hence extension of the surgical dissection medially will result in entrance into the anterior cranial fossa. All procedures directed at eradication of ethmoid sinus disease must consider these relationships. When procedures are required that limit clear identification of landmarks, use of an intraoperative guidance system should be considered.

Preoperative assessment should include careful evaluation of the nasal septum. When significant deviation of the septum is judged to compromise the ability to effectively undertake a transnasal procedure, concurrent nasal septoplasty should be planned.

Preoperatively, patients scheduled for ethmoid surgery should undergo imaging with computed tomography (CT). The coronal plane allows the best assessment of the relationship of the orbit and the fovea ethmoidalis to the ethmoid. If images are reconstructed from axial acquisition, they must be of clarity to demonstrate the fine detail of the ethmoid roof, middle turbinate, cribriform plate, and optic foramen. Axial views may best demonstrate the depth and anteroposterior relationships of the frontal sinus and its communication with the nose. These views may also be helpful when cannulation of the frontal sinus is anticipated. The CT scan should be available in the operating room for intraoperative correlations.

Surgical therapy of neoplasms involving the ethmoid sinuses is beyond the scope of this chapter. Surgery for benign neoplasms involving the middle turbinate and middle meatus may be effectively accomplished endoscopically. When wider exposure is deemed necessary, an external approach may be elected. Often a combined approach with simultaneous visualization through both the endonasal and external approaches may be beneficial in complex cases. This can be undertaken through either a lateral rhinotomy or a facial degloving approach, both of which are discussed in Chapter 10. Similarly, small, well-localized malignancies involving the middle meatus and turbinate may be removed through dissection of the lateral nasal wall. Tumors extending

superiorly to involve the fovea ethmoidalis and skull base should be managed with craniofacial techniques such as those discussed in Chapter 100.

SURGICAL APPROACHES

Intranasal Polypectomy

Most nasal polyps originate in the middle meatus and ethmoid sinuses. The sinonasal mucosa has a limited ability to respond to chronic inflammation. Edema of the sinus mucosa results in herniation of a portion of the mucosa through the ostium into the nose and is perceived as a “nasal polyp” (Fig. 13-2). These polyps are most frequently seen in the middle meatus; however, they may be encountered in the superior meatus and the sphenoethmoid recess. In advanced cases, the polyps may protrude into the nasal vestibule.

Figure 13-2 Chronic sinus disease is frequently associated with the development of polyps that extend from the sinuses into the nose.

Nasal polypectomy is most commonly undertaken using local anesthesia with or without intravenous sedation and monitoring. Some patients have a deviated nasal septum, which may interfere with adequate exposure and cause incomplete removal of polyps. If this is recognized before polypectomy, the patient should be counseled about the need for septoplasty. When the polyps obscure the view of the septum, the patient should be told that nasal septoplasty may be necessary. The polyps and surrounding nasal mucosa can be effectively anesthetized using 100 to 200 mg of cocaine dissolved in 8 to 10 mL of saline solution. The solution is placed on cotton pledgets and inserted in the nose, with care being taken to advance the pledgets as far as possible into the middle meatus and sphenoethmoid recess. After waiting 10 to 15 minutes to maximize both the anesthetic effect and vasoconstriction, the procedure is undertaken using nasal speculum, headlight, suction, and a snare. Use of the intranasal snare allows the operator to divide the polyp as it emerges from the ostium or to avulse the polyp from the ethmoid sinus. If the latter technique is used, some measure of ethmoid débridement will be achieved. When the polyps are severed at the level of the ostium, the obstruction of the sinus will naturally persist and early recurrence is

frequently encountered. In current practice, the microdébrider is often used to remove the polyp as an office procedure in order to obtain a nasal airway in patients who do not want or cannot have more definitive surgery for the polyp or the ethmoid sinus.

Intranasal Ethmoidectomy

The principal advantage of intranasal ethmoidectomy over external ethmoidectomy is the avoidance of a facial scar. Relative disadvantages are that the intranasal approach is more difficult to learn. Some surgeons have stated that intranasal ethmoidectomy precludes good anterior ethmoidectomy. Mosher described the intranasal ethmoidectomy as “the blindest and most dangerous operation in all surgery.”[4] The world has changed since 1929. The availability of modern imaging, magnification, and endoscopes has dramatically altered sinus surgery. In a 1979 review of more than 1000 intranasal ethmoidectomy procedures, however, Freedman and Kern noted a complication rate of 2.8% without mortality or blindness.[5] Before the adoption of modern endoscopes, they pointed out that the intranasal ethmoidectomy could be accomplished safely when the surgeon has complete knowledge of the anatomy and understands the surgical technique. This statement is no less valid today in the era of endoscopic visualization and intraoperative navigation.

The expanding interest in endoscopic intranasal ethmoid surgery led to renewed enthusiasm for a clearer understanding of intranasal and ethmoid anatomy. The ethmoid sinuses consist of a labyrinth containing 4 to 17 cells, with an average of 9 cells.[6] These cells are arranged along the lateral nasal wall, roughly parallel to the plane of the middle turbinate, and extend 4 to 5 cm from anterior to posterior, 2.5 cm in height. It is critical to recognize that while the ethmoid sinuses are 1.5 cm wide posteriorly, the anterior ethmoid may be only 0.5 cm wide and the relatively narrow anterior ethmoid represents an area of potential danger in that penetration of the lateral margin of the ethmoid results in entry into the orbit.

During examination of the ethmoid labyrinth from an intranasal perspective, the anterior extent of the ethmoid labyrinth is approached through the middle meatus. The draining ostia of the ethmoid cells are obscured by the uncinate process and the medial projection of the largest cell the bulla. The uncinate process is a semilunar structure that begins immediately posterior to the agger nasi cells (anterior attachment of the middle turbinate) and extends posteriorly in the middle meatus. Its termination is frequently hidden by the overhanging middle turbinate. Intranasal surgical access to the ethmoid cells requires that the uncinate process be removed so that the extra cells, especially the agar nasi, can be visualized. Entry into the anterior ethmoid cell at this point is achieved; however, the proximity of the lamina papyracea (5 mm laterally) must be recognized. Removal of the medial, anterior, and inferior walls of the ethmoid bulla leads to the basal lamella posteriorly, which separates the anterior from the posterior ethmoid cells. The basal lamella is the major attachment of the middle turbinate to the ethmoid and lamina papyracea. Passing through the basal lamella in a plane parallel to the middle turbinate brings the surgeon to the posterior ethmoid cells. The lateral wall is the lamina papyracea, and dissection carried laterally exposes and may violate the orbit. Posteriorly the optic nerve is immediately adjacent, and in well-pneumatized sinuses may actually pass through the posterior ethmoid sinus.

Intranasal ethmoidectomy may be undertaken with the patient under either general anesthesia or local anesthesia supplemented by intravenous sedation and monitoring. Application of intranasal medication is necessary with either anesthetic technique in that control of bleeding requires either topical application of vasoconstrictor substances or injection. We advocate the use of oxymetazoline 0.25% on cotton pledgets employed topically. This is supplemented with lidocaine 1% with epinephrine 1 : 100,000 injected into the mucosa of the anterior attachment of the middle turbinate. Powered tissue removal instruments are preferred over grasping instruments, in that they avoid the tearing and resultant bleeding that impairs visualization. The uncinate process is removed and the middle turbinate can be fractured medially or the anterior half removed in an effort to afford better exposure of the middle meatus and ethmoid labyrinth. Landmarks include the lamina papyracea laterally and the insertion of the middle turbinate superiorly, which marks the area of the fovea ethmoidalis and the position of the cribriform plate. As the operator extends the procedure posteriorly, great care must be taken to identify the anterior face of the sphenoid, which accordingly identifies the posterior ethmoid cell. Immediately posterior to the posterior ethmoid cell and often identifying it is the optic nerve, which must not be damaged.

The important surgical landmarks for ethmoidectomy are as follows. One should not extend the operation superior to the attachment of the middle turbinate, because this attachment marks the level of the fovea ethmoidalis. The external landmark for the fovea ethmoidalis is the medial canthus. The operation should not be extended superior to a line drawn horizontally between the medial canthi. Similarly, the procedure should not be extended laterally through the lamina papyracea. A vertical line drawn through the medial canthus generally estimates this position. All tissue should be examined as it is removed. The recognition of orbital fat as a specimen is an indication of penetration of the orbit. When placed into normal saline solution, fat floats whereas mucosa sinks.

When powered instruments are employed for ethmoidectomy, it is essential that the surgeon be acutely aware of the anatomy to avoid penetration of the orbit or central nervous system. Recall that the suction of powered instruments can draw orbital contents through bony dehiscence. Evidence of bone dehiscence or erosion is a

relative contraindication to the use of power débriders. Intranasal tampons are placed at the end of the procedure.

POSTOPERATIVE MANAGEMENT

Postoperatively, patients are maintained with the head elevated. A gauze pad taped to the upper lip facilitates management of small amounts of mucosanguineous rhinorrhea. Under most circumstances, the intranasal tampon can usually be removed before patient discharge. The most common postoperative problem is epistaxis. The risk can be reduced through avoidance of nose blowing, sneezing with the mouth open, and avoiding vigorous exercise for 2 to 3 weeks.

The patient is asked to return to the office approximately 1 week postoperatively, at which time the intranasal structures are carefully inspected, crusts are removed, and mucoid debris is removed. At this time, the patient is begun on a course of nasal hygiene employing intranasal instillation of either saline or steroid solutions applied with an atomizer. The patient should return to the office at regular intervals until mucosalization of the ethmoid sinus is complete. When synechiae develop between the middle meatus and the lateral nasal wall, they should be removed to provide maintenance of good drainage of the ethmoid sinus. This can be undertaken in the office with topical anesthesia and microsurgical instruments.